

### SCOPE OF CLAIMS

1. A method of forming one or more carbonaceous material projections, the method comprising the steps of:

applying a resist onto a carbonaceous material substrate;

5 forming holes in the applied resist, the holes being provided according to a predetermined arrangement, each hole having a wall surface, and the wall surface being inversely tapered from an aperture thereof toward a bottom thereof;

10 depositing mask material for a mask on the carbonaceous material substrate to form a mask deposition in each hole;

lifting off the mask material deposited on the resist together with the resist; and

15 etching the carbonaceous material substrate by using the mask deposition as a mask to form one or more carbonaceous material projections.

2. The forming method of the carbonaceous material projection according to claim 1, wherein the carbonaceous material projections have a projected diameter of not more than 300 nm, and a density of the carbonaceous material projections is equal to or more  
20 than 4 projections/ $\mu\text{m}^2$ .

3. The forming method of the carbonaceous material projection according to claim 1 or 2, wherein each carbonaceous material projection is of a conical shape.

25 4. A method of forming a carbonaceous material projection, the method comprising the steps of:

forming a film on a carbonaceous material substrate, the film

being made of one of a silicon-based nitride ( $\text{SiN}_x$ :  $0 < x < 1.33$ ) and silicon-based nitride oxide ( $\text{SiO}_x\text{N}_y$ :  $0 < x < 2$ ,  $0 < y < 1.3$ );

applying a resist onto the film formed on the carbonaceous material substrate, patterning the resist by one of photolithography and electron beam exposure to form a patterned resist of a dot shape, and  
5 processing the film by use of the patterned resist as a mask; and

etching the carbonaceous material substrate by use of an etching mask including the processed film to form a carbonaceous material projection.

10 5. A carbonaceous material projection structure comprising a plurality of carbonaceous material projections provided according to a predetermined arrangement, a density of the carbonaceous material projections being not less than 4 projections/ $\mu\text{m}^2$ , and tips of the projections being smaller than roots of the projections.

15 6. A carbonaceous material projection structure comprising a plurality of carbonaceous material projections provided according to a predetermined arrangement, each carbonaceous material projection having an approximately conical shape, and an apex angle of each carbonaceous material projection being not more than 39 degrees.

20 7. The carbonaceous material projection structure according to claim 6, wherein a tip diameter of each carbonaceous material projection is not more than 50 nm, and a uniformity of heights of the carbonaceous material projections is within  $\pm 5\%$ .

25 8. The carbonaceous material projection structure according to claim 6 or 7, wherein a projection density of the carbonaceous material projections is not less than 4 projections/ $\mu\text{m}^2$ .